David G. Hawkins

Director, Climate Programs

Natural Resources Defense Council

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Summary

Coal use today is responsible for large and mostly avoidable damages to human health and our water and land. Coal use in the future, along with other fossil fuels, threatens to wreak havoc with the earth's climate system. Coal has fueled economic growth in the world's largest economies. But we cannot solve the climate crisis unless we cut coal's global warming emissions dramatically. We have the tools to do this. Energy efficiency, increased reliance on renewables like wind, solar, and biomass, and capture of carbon dioxide from power and industrial coal plants followed by geologic disposal (CCD or CCS) can play a major role in harmonizing our economic, security and climate protection goals.

But these tools will not be deployed at the required scale unless we enact new laws to cut global warming pollution. New coal plants forecast to be built globally in the next two decades, if not equipped with CCD, will emit 30 per cent more carbon dioxide (CO_2) in their operating lives than has been released from all prior human use of coal. We cannot afford to delay enactment of policies to prevent this train wreck.

The US Climate Action Partnership (USCAP), of which NRDC is a member, has proposed a Blueprint for Legislative Action that combines an economy-wide cap and trade program with performance-based policies focused on reducing CO_2 emissions from coal use. NRDC believes this program can be effective in protecting the climate and managing the transition to a cleaner energy future. CCD can also deliver major energy security benefits as well.

Congress needs to enact this year a comprehensive climate protection program containing these elements. Well designed measures can phase in CCD on new coal plants with only very modest impacts on retail electricity prices. Government support of initial large-scale capture and injection projects will be needed to speed deployment and build confidence.

Testimony of David G. Hawkins

Director, NRDC Climate Programs

Thank you for the opportunity to testify today on the subject of coal and climate legislation. My name is David Hawkins. I am director of Climate Programs at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles and San Francisco, Chicago and Beijing.

Today, the U.S. and other developed nations around the world run their economies largely with industrial sources powered by fossil fuel and those sources release billions of tons of carbon dioxide (CO_2) into the atmosphere every year. There is national and global interest today in capturing that CO_2 for disposal or sequestration to prevent its release to the atmosphere. To distinguish this industrial capture system from removal of atmospheric CO_2 by soils and vegetation, I will refer to the industrial system as carbon capture and disposal or CCD. CCD can be applied to many different sources of CO_2 but today I will focus on its role in cutting emissions from coal use.

The growing attention to CCD stems from a few basic facts. We now recognize that CO_2 emissions from use of fossil fuel result in increased atmospheric concentrations of CO_2, which along with other so-called greenhouse gases trap heat, leading to an increase in temperatures,

regionally and globally. These increased temperatures alter the energy balance of the planet and thus change our climate, which is simply nature's way of managing energy flows. Documented changes in climate today along with those forecasted for the next decades, are predicted to inflict large and growing damage to human health, economic well-being, and natural ecosystems.

Coal is the most abundant fossil fuel and is distributed broadly across the world. It has fueled the rise of industrial economies in Europe and the U.S. in the past two centuries and is fueling the rise of Asian economies today. Because of its abundance, coal is cheap and that makes it attractive to use in large quantities if we ignore the harm it causes. However, per unit of energy delivered, coal today is a bigger global warming polluter than any other fuel: double that of natural gas; 50 per cent more than oil; and, of course, enormously more polluting than renewable energy, energy efficiency, and, more controversially, nuclear power. To reduce the contribution to global warming from coal use, we can pursue efficiency and renewables to limit the total amount of coal we consume but to reduce emissions from the coal we *do* use, we must deploy and improve systems that will keep the carbon in coal out of the atmosphere, specifically systems that capture carbon dioxide (CO_2) from coal-fired power plants and other industrial sources for safe and effective disposal in geologic formations.

The Toll from Coal

Before turning to the role of CCD I want to repeat what I have said in prior testimony about harms from coal as it is used today. The role of coal now and in the future is controversial due to the damages its production and use inflict today and skepticism that those damages can or will be reduced to a point where we should continue to rely on it as a mainstay of industrial economies.

Coal is cheap and abundant compared to oil and natural gas. But the toll from coal as it is used today is enormous. From mining deaths and illness and devastated mountains and streams from practices like mountain top removal mining, to accidents at coal train crossings, to air emissions of acidic, toxic, and heat-trapping pollution from coal combustion, to water pollution from coal mining and combustion wastes, the conventional coal fuel cycle is among the most environmentally destructive activities on earth. Certain coal production processes are inherently harmful and while our society has the capacity to reduce many of today's damages, to date, we have not done so adequately nor have we committed to doing so. These failures have created well-justified opposition by many people to continued or increased dependence on coal to meet our energy needs.

Our progress of reducing harms from mining, transport, and use of coal has been frustratingly slow and an enormous amount remains to be done. Today mountain tops in Appalachia are destroyed to get at the coal underneath and rocks, soil, debris, and waste products are dumped into valleys and streams, destroying them as well. Waste impoundments loom above communities (including, in one particularly egregious case, above an elementary school). Thousands of miles of streams are polluted by acid mine drainage. In other areas surface mine reclamation is incomplete, inadequately performed and poorly supervised due to regulatory gaps and poorly funded regulatory agencies. As we have learned in recent months, coal ash dumps are enormous, ubiquitous, and almost completely unregulated, leading to disasters like those which occurred at several dumps recently.

In the area of air pollution, although we have technologies to dramatically cut conventional pollutants from coal-fired power plants, in 2004 only one-third of U.S. coal capacity was equipped with scrubbers for sulfur dioxide control and even less capacity applied selective catalytic reduction (SCR) for nitrogen oxides control. And under the previous administration's so-called CAIR rule, even in 2020 nearly 30 per cent of coal capacity would still not employ scrubbers and nearly 45 per cent would lack SCR equipment. Moreover, because the previous administration deliberately refused to require use of available highly effective control technologies for the brain poison mercury, unless corrective action is taken, we will suffer decades more of cumulative dumping of this toxin into the air at rates several times higher than is necessary or than faithful implementation of the Clean Air Act would achieve (to say nothing regarding harms from other toxins the rule ignores).

Finally, there are no controls in place for CO_2, the global warming pollutant emitted by the more than 330,000 megawatts of coal-fired plants in the U.S.; nor are there any CO2 emission standards adopted today for old or new plants save in California.

Mr. Chairman and members of the subcommittee, the environmental community is criticized in some quarters for our generally negative view regarding coal as an energy resource. But I would ask you to consider the reasons for this. Our community reacts to the facts on the ground and in the air and those facts are far from what they must be if coal is to play a role as a responsible part of the 21st century energy mix. Rather than simply decrying the attitudes of those who question whether using large amounts of coal can and will be carried out in a responsible manner and spending millions on TV ads that paint a misleading picture of coal's actual performance, the coal industry in particular should support policies to correct today's abuses and then implement

those reforms. Were the industry to do this, there would be real reasons for critics of coal to consider whether coal can in fact provide more benefits than harm going forward.

The Need for CCD

Turning to CCD, NRDC opposes new coal plants that do not capture their CO_2 and supports rapid deployment of capture and disposal systems for any new coal sources. Such support is not a statement about how dependent the U.S. or the world should be on coal and for how long. Any significant additional use of coal that vents its CO2 to the air is fundamentally in conflict with the need to keep atmospheric concentrations of CO2 from rising to levels that will produce dangerous disruption of the climate system. Given that an immediate world-wide halt to coal use is not plausible, analysts and advocates with a broad range of views on coal's role should be able to agree that, if it is safe and effective, CCD should be rapidly deployed to minimize CO2 emissions from the coal that we do use.

Today coal use and climate protection are on a collision course. Without rapid deployment of CCD systems, that collision will occur quickly and with spectacularly bad results. The very attribute of coal that has made it so attractive—its abundance---magnifies the problem we face and requires us to act now, not a decade from now. Until now, coal's abundance has been an economic boon. But today, coal's abundance, absent corrective action, is more bane than boon.

Since the dawn of the industrial age, human use of coal has released about 150 billion metric tons of carbon into the atmosphere—about half the total carbon emissions due to fossil fuel use in human history. But that contribution is the tip of the carbon iceberg. Another 4 *trillion* metric

tons of carbon are contained in the remaining global coal resources. That is a carbon pool nearly seven times greater than the amount in our pre-industrial atmosphere. Using that coal without capturing and disposing of its carbon means a climate catastrophe.

And the die is being cast today for that catastrophe, not decades from now. Decisions being made today in corporate board rooms, government departments, and congressional hearing rooms are determining how the next coal-fired power plants will be designed and operated. Power plant investments are enormous in scale, more than $1 billion per plant, and plants built today will operate for 60 years or more. The International Energy Agency (IEA) forecasts that more than $5 trillion will be spent globally on new power plants in the next two decades. Under IEA's forecasts, about 1800 gigawatts (GW) of new coal plants will be built between now and 2030—capacity equivalent to 3000 large coal plants, or an average of ten new coal plants every month for the next two decades. This new capacity amounts to 1.5 times the total of all the coal plants operating in the world today.

The astounding fact is that under IEA's forecast, 7 out of every 10 coal plants that will be operating in 2030 don't exist today. That fact presents a huge opportunity—many of these coal plants will not need to be built if we invest more in efficiency; additional numbers of these coal plants can be replaced with clean, renewable alternative power sources; and for the remainder, we can build them to capture their CO_2, instead of building them the way our grandfathers built them.

If we decide to do it, the world could build and operate new coal plants so that their CO_2 is returned to the ground rather than polluting the atmosphere. But we are losing that opportunity with every month of delay—10 coal plants were built the old-fashioned way last month somewhere in the world and 10 more old-style plants will be built this month, and the next, and the next. Worse still, with current policies in place, none of the 3000 new plants projected by IEA are likely to capture their CO_2.

Each new coal plant that is built carries with it a huge stream of CO_2 emissions that will likely flow for the life of the plant—60 years or more. Suggestions that such plants might be equipped with CO_2 capture devices later in life might come true but there is little reason to count on it. While commercial technologies exist for pre-combustion capture from gasification-based power plants, most new plants are not using gasification designs and the few that are, are not required to incorporate capture systems. Installing capture equipment at these new plants after the fact is still a long shot for traditional coal plant designs and expensive for gasification processes.

If all 3000 of the next wave of coal plants are built with no CO_2 controls, their lifetime emissions will impose an enormous pollution lien on our children and grandchildren. Over a projected 60-year life these plants would likely emit 750 billion tons of CO_2, a total (from just over two decades of investment decisions) that is 30% greater than the total CO_2 emissions from all previous human use of coal. Once emitted, this CO_2 pollution load remains in the atmosphere for centuries. Half of the CO_2 emitted during World War I remains in the atmosphere today. One thousand years from now, 15 per cent of World War I CO_2 pollution will still be in the air.

As a first order of business we must prevent the harm from this onrushing train of new coal plants. What can the U.S. do to help? We should adopt a national policy that new coal plants be required to employ CCD without delay. By taking action ourselves, we can speed the deployment of CCD here at home and set an example of leadership. That leadership will help reconcile coal and climate protection; it will bring us economic rewards in the new business opportunities it creates here and abroad; and it will speed engagement by critical countries like China and India.

To date our efforts have been limited to funding research, development, and limited demonstrations. Such funding can help in this effort if it is wisely invested. But government subsidies cannot substitute for the driver that a real market for low-carbon goods and services provides. That market will be created only when requirements to limit CO_2 emissions are adopted.

New Coal Build in the U.S.

I have discussed the phenomenal projected growth in global coal power generation. Until recently, the projections for the U.S. also showed very large increases in new coal power plants. One year ago our Energy Information Administration (EIA), in its 2008 Annual Energy Outlook, forecast that 100 GW of new coal plants would be built by 2030 (increasing the U.S. coal fleet by nearly a third above the current 330 GW of capacity). However, in its most recent projection EIA has cut its estimate of new coal build in the U.S. by 60 per cent, projecting that only 42 GW of new coal will be built between now and 2030. Moreover, EIA projects that once the plants currently under construction are built there will be a decade of essentially *no* additional coal

projects, with new projects appearing only around 2025. I need to emphasize that this is *not* an EIA estimate of the impact of climate protection legislation. To the contrary, this is what EIA estimates will happen with *no* action on climate legislation. Why this major change in EIA's estimates? Well, for the first time EIA has incorporated into its projections what it observes is happening in the private sector U.S. energy market in the absence of climate legislation. EIA states its new projection "reflects the behavior of investors and regulators who, in their investment evaluation process, are implicitly (or explicitly) adding a cost to many proposed power plants that employ GHG-intensive technologies." (EIA, Press Release, Dec. 17, 2008).

The reality is that contrary to the assumptions of the coal lobby, blocking action on climate protection is not an effective strategy for a sustainable coal industry. In the absence of climate legislation virtually every significant coal project is being challenged (and most are challenged successfully), investment banks are taking a harder look at carbon risks, and state regulators are rejecting plants as too risky given the uncertainty about policies that are likely to require actions to reduce these projects' carbon footprint.

Meanwhile, faced with the obligation to comply with the Supreme Court's ruling that the Clean Air Act requires regulation of CO_2 as a pollutant (absent a factually impossible showing), EPA is expected to take steps soon to establish CO_2 emission limits from a number of sources, including fossil-fueled power plants. If written in accordance with the law, these EPA rules will put an end to the construction of new coal plants that release all of their CO_2 to the air.

NRDC believes it is possible to implement such rules in a manner that is entirely compatible with meeting our needs for electric power from secure energy resources at reasonable costs. However, there are a number of reasons why both environmentalists and supporters of coal should favor enactment of legislation that complements and provides greater definition for the existing Clean Air Act authority while providing additional policies to speed deployment of CCD for the new coal plants that may be built. First, EPA rules by themselves will not get reductions at the scale and pace we must achieve. Second, new EPA rules are likely to be litigated but legislation could substantially narrow the issues and uncertainties associated with such litigation, or possibly avoid it completely. In addition, legislation could provide a framework for equitable sharing of the likely additional costs of the first generation of coal plants employing CCD. It is possible that a consensus could emerge that would endorse such cost sharing in order to gain additional support for comprehensive climate protection legislation.

Policy Actions to Speed CCD

NRDC supports inclusion of policies to deploy CCD in broad climate protection legislation. We need those policies both to deal with the new coal plants that are built in the U.S. and to create the conditions that will speed the commitment to strong climate protection policies by countries like China, where last year a large new coal plant started up about every four days. There is no reasonable expectation that China will turn its back on coal in the near future and a U.S. CCD deployment program could make it apparent to China and the world at large that climate protection does not require abandoning the appropriate use of coal as an energy resource.

There are three key policies to speed deployment of CCD systems:

- A comprehensive cap on greenhouse gas emissions;
- Emission performance standards for new coal plants;
- Cost-sharing for added expenses for CCD projects in the near-term.

This package of policies is included in the recent Blueprint for Legislative Action released by the U.S. Climate Action Partnership (USCAP). While I am testifying today on behalf of NRDC and not USCAP as a whole, NRDC is a USCAP member and we support these policy proposals.

Why do we need these policies? While research and development funding is useful, it cannot substitute for the incentive that a genuine commercial market for CO_2 capture and disposal systems will provide to the private sector. The amounts of capital that the private sector can spend to optimize CCD methods will dwarf what Congress will provide with taxpayer dollars. To mobilize those private sector dollars, Congress needs a stimulus more compelling than the offer of modest handouts for research. Congress has a model that works: intelligently designed policies to limit emissions cause firms to spend money to find better and less expensive ways to prevent or capture emissions.

Where a technology is already competitive with other emission control techniques, for example, sulfur dioxide scrubbers, a cap and trade program like that enacted by Congress in 1990, can result in more rapid deployment, improvements in performance, and reductions in costs. Today's scrubbers are much more effective and much less costly than those built in the 1980s. However, a CO_2 cap and trade program by itself may not result in deployment of CCD systems as rapidly as we need. Many new coal plant design decisions are being made literally today.

Depending on the pace of required reductions under a global warming bill, a firm may decide to build a conventional coal plant and purchase credits from the cap and trade market rather than applying CCD systems to the plant. While this may appear to be economically rational in the short term, it is likely to lead to higher costs of CO_2 control in the mid and longer term if substantial amounts of new conventional coal construction lead to ballooning demand for CO_2 credits.

Recall that in the late 1990's and the first few years of this century, individual firms thought it made economic sense to build large numbers of new gas-fired power plants. The problem is too many of them had the same idea and the resulting increase in demand for natural gas increased both the price and volatility of natural gas to the point where many of these investments were idle for years.

Moreover, delaying the start of CCD until a cap and trade system price is high enough to produce these investments delays the broad demonstration of the technology that the U.S. and other countries will need if global coal use remains high. The more affordable CCD becomes, the more widespread its use will be throughout the world, including in rapidly growing economies like China and India. But the learning and cost reductions for CCD that are desirable will come only from the experience gained by building and operating the initial commercial plants. The longer we wait to ramp up this experience, the longer we will wait to see CCD deployed here and in countries like China.

Accordingly, we believe the best policy package is a hybrid program that combines the breadth and flexibility of a cap and trade program with well-designed emission standards and incentives

that are focused on key technologies like CCD. Such policies serve two purposes. First, they assure that no new coal plants are built without CCD systems. New coal plants with uncontrolled CO_2 emissions will increase costs for others now or in the future or both. Second, they provide a stimulus for early and significant deployment of CCD systems. These two purposes may appear to be the same but they are not. Requiring new coal plants to use CCD will not assure early deployment of CCD if no new coal plants are built for some time. And without a mandatory emission standard there is no assurance that construction of conventional coal plants will be prevented. But a combination of emission standards and financial incentives can achieve both of these objectives.

First, we need a CO_2 emissions standard that applies to new power investments. California enacted such a measure in SB1368 in 2006. It requires new investments for sale of power in California to meet a performance standard that is achievable by coal with a moderate amount of CO_2 capture. CO_2 emission performance standards also were included in Chairman Markey's iCAP bill, H.R. 6186, introduced in the last Congress.

Second, we need a mechanism to assure that individual firms making investment decisions have an economic rationale to deploy and operate CCD in the period before the market price for CO_2 under a cap program is high enough to provide that rationale by itself. This can be accomplished by providing a financial incentive for avoiding CO_2 emissions by using CCD. A specified dollar per ton payment for CO_2 avoided, similar in effect to a production tax credit, can accomplish this objective.

These two measures work together to achieve a result that neither could accomplish alone. The mandatory emission standard prevents the construction of new coal plants without CCD, something that could happen in the absence of a standard during the early period under a cap program. The financial incentive payment avoids placing the entire incremental cost of the first CCD units on the customers of the companies that build the plants. This cost sharing avoids significant rate impacts from implementation of the mandatory emission standard and avoids creating an incentive to build new natural gas fired power plants.

USCAP Recommendations

As I mentioned, the USCAP Blueprint for Legislation Action contains a comprehensive proposal for CCD deployment as part of a broad climate protection law. In addition to an economy-wide cap, the Blueprint recommends Congress adopt the following measures:

- requirements for the government to issue needed regulations for siting CO_2 repositories and pipelines;
- government financial support to build 5 GW of CCD-equipped commercial power plants by 2015;
- a transitional program to pay for tons of CO_2 emissions avoided through use of CCD;
- mandatory emission standards for new coal plants that are not already permitted as of today.

USCAP recommends a mandatory emission standard of 1100 pounds per megawatt hour (lbs/MWh) for coal plants permitted between now and 2020 and an 800 lbs/MWh mandatory standard for plants permitted after the start of 2020, with authority for EPA to establish tighter

standards as justified by technical and economic feasibility considerations. Compliance with the initial emission standard would be required upon startup for plants permitted after January 1, 2015. For plants permitted between now and January 1, 2015, compliance would be required within four years after either 2.5 GW of commercial scale CCD power plants are operating in the U.S. or 5 GW of such plants are operating globally. This recommendation guarantees that any proposed coal project not already permitted today must meet an emission standard that requires the operation of CCD, either upon startup or early in its operating life.

USCAP support for this important policy is tied to enactment of a substantial program to provide financial incentives for capturing CO_2. USCAP calls for a program of direct payments on a dollar per ton of CO_2 avoided basis for the first ten years of operation of CCD systems. Payments would be based on two sliding-scales. Higher payments per ton avoided would be provided for earlier projects to reflect estimated higher costs and to provide an added incentive for early operation of CCD projects. The payment schedule would be highest for the first 3 GW of projects in the program, with successively smaller payments for later projects. In addition, a separate sliding scale would provide higher dollar per ton payments for projects with higher capture rates. This would reflect the expected higher costs for high capture rate systems and would provide an incentive to achieve lower emission rates than the minimum mandatory emission standard. For example, for a project in the first 3 GW of the program that achieved a high level of capture (85-90%), the payments for the expected incremental costs are estimated to be on the order of $90 per ton avoided. USCAP recommends that the total size of the financial incentive program should be large enough to support on the order of 72 GW of CCD projects.

Energy Security Benefits of CCD

In addition to providing a means for major reductions in CO_2 emissions from coal plants, CCD can also provide substantial energy security benefits. CCD can help reduce dependence on foreign oil while reducing CO_2 emissions in two important ways. First, substantial deployment of CCD can produce a reliable and affordable supply of CO_2 for use in domestic enhanced oil recovery (EOR) operations. For more than two decades U.S. producers have been using CO_2 to increase oil production in aging oil fields. From both an environmental impact and energy security perspective, these EOR barrels are the best barrels of oil we can buy. They are produced from fields that are already developed and use existing pipelines. Every barrel produced from these fields reduces pressure to develop pristine and vulnerable areas to supply that oil. Second, every barrel of this oil means one less barrel imported from hostile or unstable regimes abroad. Today EOR barrels make up only a small amount of total U.S. consumption—about 300,000 barrels per day. Why such a small amount? Believe it or not, it is because supplies of CO_2 are limited! Most EOR today uses CO_2 from naturally occurring CO_2 reservoirs and those are fully committed. Without a climate protection policy, the costs of deploying CCD at power plants and other industrial sources to supply EOR operations are too high to tap this huge additional supply of manmade CO_2.

With a program of CCD deployment like that recommended by USCAP, U.S. EOR production could back out millions of barrels per day of imported oil. An NRDC analysis of the impacts of climate legislation with CCD deployment, based on DOE studies of EOR potential, projects that increased domestic EOR using captured CO_2 could reduce oil imports by about 2 million barrels

per day in 2020 and as much as 5 million barrels per day in 2025. (http://docs.nrdc.org/globalWarming/files/glo_08061201a.pdf).

Second, if CCD is applied to the power fleet it can increase the penetration of plug-in hybrids compared to a scenario where CCD is not deployed, backing out even more imported oil. (*Id.*) These additional energy security benefits of speeding CCD deployment are considerable and should broaden the base of support for an integrated program of climate protection and energy reform.

Costs and other concerns

Let me add a few words about costs. With today's off the shelf systems, estimates are that the production cost of electricity at a coal plant with CCD could be as much as 40% higher than at a conventional coal plant that emits its CO_2. But the impact on average electricity prices of introducing CCD now will be very much smaller due to several factors. First, power production costs represent about 60% of the price you and I pay for electricity; the rest comes from transmission and distribution costs. Second, coal-based power represents just over half of U.S. power consumption. Third, and most important, even if we start now, CCD would be applied to only a small fraction of U.S. coal capacity for some time. With the financial incentives recommended by USCAP, the incremental costs of units equipped with CCD would be spread over the all consumers of fossil fuels. This should result in a very modest increase (on the order of two or three per cent) in average U.S. retail electricity rates attributable to a large-scale CCD deployment program.

Another concern that has been raised by some is the issue of liability for possible risks of CO_2 injected in geological formations. Some have called for governmental assumption of this liability. NRDC strongly opposes governmental indemnification as unnecessary and counterproductive to CCD deployment. The first point to note is that all expert assessments have concluded that the risks from properly conducted CO_2 injection projects are extremely low. The Special Report on Carbon Dioxide Capture and Storage published by the Intergovernmental Panel on Climate Change (IPCC) concluded that the risks were no higher than other industrial energy sector operations.

Risks from CCD can be divided into two phases: risks of leakage during the operation phase of CO_2 injection and longer term (hundreds of years) risks of leakage. Current EOR operations involve in some cases injection of CO_2 in amounts equal to a large coal-fired power plant. Private sector firms are carrying out these projects now with no governmental assumption of risk. While we are not privy to the contractual or insurance instruments that are employed to manage liability for these operational risks, it is clear that private sector commercial arrangements are sufficient for these firms to be comfortable in carrying out these projects.

Longer term risks should be addressed by a thorough pre-injection permitting process that requires a comprehensive site assessment and requires design, operational, and monitoring practices that provide a high level of confidence that injected CO_2 will remain where it is injected permanently. Some persist in asking what happens if some CO_2 does nonetheless get back to the atmosphere decades or centuries from now and paint pictures of damage actions being brought against the sources that injected the CO_2. We find this scenario hard to credit as a

serious obstacle to sources deciding to proceed with CCD now. Consider the choices facing the owner of a proposed coal power plant: it can emit its CO_2 to the air and half of what it emits will still be in the air 100 years from now. Or it can inject that CO_2 into geologic formations with a high degree of confidence that all of that CO_2 will still be in the formation 100 years from now. If one assumes a future legal regime that imposes damages liability on sources because of the presence in the air of CO_2 that they produced 100 years earlier, it will obvious to any competent risk manager that the potential liability from CO_2 injection is orders of magnitude smaller than the risk of continuing to emit that CO_2 directly to the air today.

Proposals for the government to shield firms from CCD liability are also counterproductive to the objective of deploying CCD. In addition to overcoming policy and economic obstacles, deployment of CCD depends on public acceptance of this unfamiliar technology. If the CCD industry is seeking government protection from liability it will be logical for the public to assume this technology is too risky for the private sector itself to accept, absent that shield. This is not factually correct but promotion of such liability shields could result in an enormous obstacle to public acceptance of CCD.

Finally, let me say a word about China and other developing coal-dependent economies. America became an industrial giant by using coal and countries like China and India are on a path to emulate that history. Both countries are interested in CCD technology but all indications are that they will wait to see what the U.S. does before making a commitment to this and the broader range of climate protection solutions we need. By showing leadership the U.S. can demonstrate seriousness of purpose that can be contagious. With our slower rate of new plant

construction we can also deploy CCD on new plants with a much smaller impact on our economy. The experience that early deployment of CCD in the U.S. can provide will help bring down costs of the technology, thereby speeding its adoption in other countries. Pursuit of such a program is not altruism. By getting ahead of the curve with CCD and other climate protection technologies, the U.S. can become a leading global marketer of climate solutions, helping bring back our economy and providing living wages to more American workers.

Conclusions

To sum up, since we will almost certainly continue using substantial amounts of coal in the U.S. and globally in the coming decades, it is imperative that we act now to deploy CCD systems. Commercially demonstrated CO_2 capture systems exist today and competing systems are being researched. Improvements in current systems and emergence of new approaches will be accelerated by requirements to limit CO_2 emissions. Geologic disposal of large amounts of CO_2 is viable and we know enough today to conclude that it can be done safely and effectively. EPA must act without delay to revise its regulations to provide the necessary framework for efficient permitting, monitoring and operational practices for large scale permanent CO_2 repositories.

A cap and trade program for greenhouse gases is essential to change the way we use coal but it does not assure in its early years the deployment of CCD technology. To achieve that objective, we need complementary policies that require minimum emission standards from new investments and incentives to deploy CCD broadly.

Finally CCD is an important strategy to reduce CO_2 emissions from fossil fuel use but it is not the basis for a climate protection program by itself. Increased reliance on low-carbon energy resources is the key to protecting the climate. The cleanest energy resource of all is smarter use of energy; energy efficiency investments will be the backbone of any sensible climate protection strategy. Renewable energy will need to assume a much greater role than it does today. With today's use of solar, wind and biomass energy, we tap only a tiny fraction of the energy the sun provides every day. There is enormous potential to expand our reliance on these resources. We have no time to lose to begin cutting global warming emissions. Fortunately, we have technologies ready for use today that can get us started.

Mr. Chairman, that completes my testimony, I will be happy to take any questions you or other members of the subcommittee may have.